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# U.S. National/Naval Ice Center

## Sea Ice Products and Services



USN



USCG



NOAA

**CDR Kelly Taylor**  
Commanding Officer

**LCDR Robert Atkinson**  
Executive Officer

**Mr. Sean Helfrich**  
(Acting) Deputy Director

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# U.S. National/Naval Ice Center

## Mission

The U.S. National Ice Center (NIC) is a tri-agency partnership of the United States Navy (USN), the National Oceanic and Atmospheric Administration (NOAA), and the United States Coast Guard (USCG) providing global ice and snow analysis and short term forecasting services for the maximum benefit of the United States government.

## Vision

To be the U.S. government's authority on global sea ice and snow analysis and forecasting.

## Goals

Goal 1. Develop Capabilities

Goal 2. Transition Science and Technology

Goal 3. Strengthen Partnerships

Goal 4. Professional Excellence





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# U.S. National Ice Center History

- **1976: Common requirements between Navy and NOAA resulted in the formation of the Navy/NOAA Joint Ice Center (JIC).**
- **1995: USCG joined, JIC became the U.S. National/Naval Ice Center (NIC/NAVICE).**
- **NIC responsibilities established via Annex V under the MOA between DOC and DON.**
  - Participating authorities
    - NOAA: 15 U.S.C. § 313, 15 U.S.C. § 2921 et seq., and 15 U.S.C. § 1525.
    - Navy: 10 U.S.C. § 5013.
    - USCG: 14 U.S.C. § 141.
- **The NIC Executive Steering Committee consists of a representative from each organization (Navy, NOAA, USCG).**

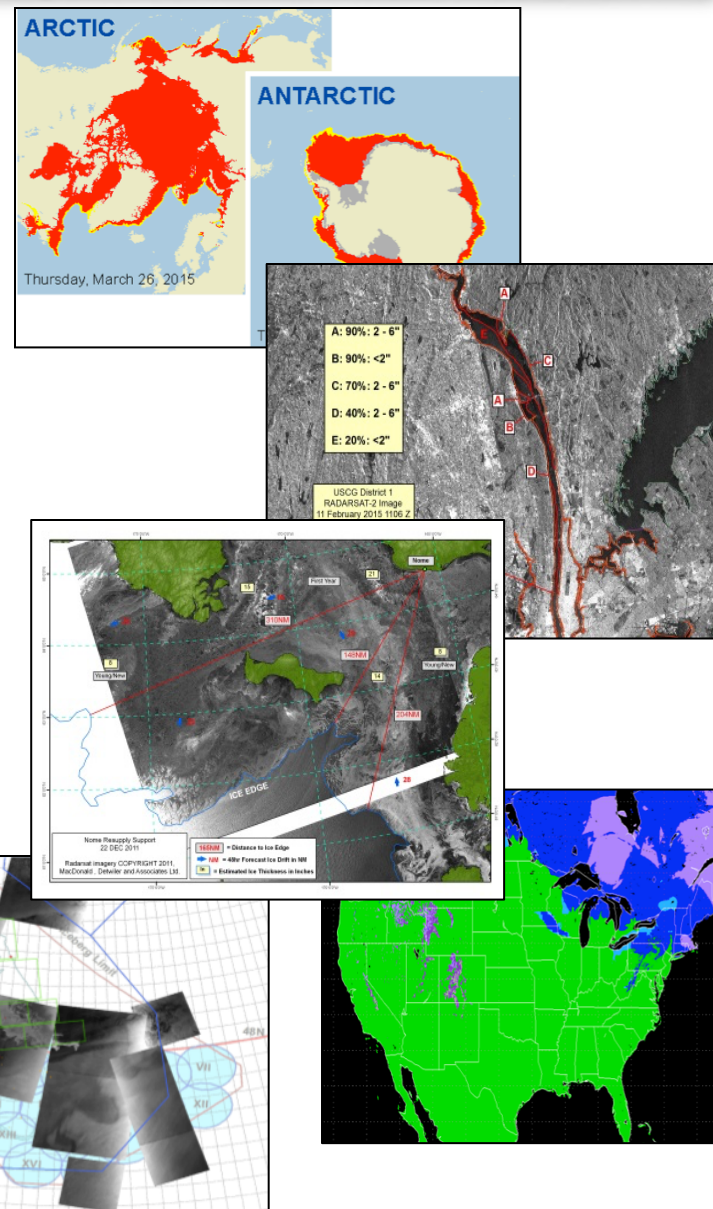
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# Requirements: Navy, NOAA, USCG

- Daily Sea Ice Edge Analysis and Forecast
- Daily Sea Ice Concentration Analysis and Forecast
- Daily Iceberg location (Arctic/Antarctic)
- Fractures, Leads, and Polynyas (FLAP) Analysis and Forecast
- CONUS Ice Analysis: Great Lakes and Chesapeake and Delaware Bays
- Climatological Outlooks
- Global Snow and Ice Monitoring
- Daily Imagery Analysis
- On-scene Ice Analyst



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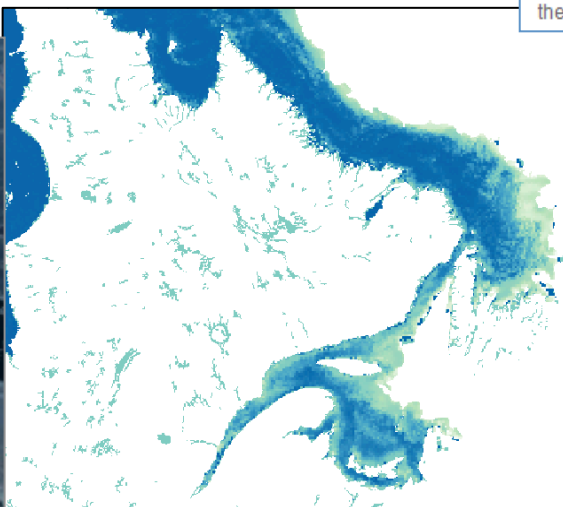
# NIC & National Strategy

Navy, NOAA, Coast Guard

- Improve Awareness
- Broaden Partnerships
- Strengthen Foundational Science



Crew members and scientists from the US Coast Guard icebreaker Healy haul a buoy across the sea ice during a deployment. In the lead, BM3 Yeckley is on bear watch, followed by SN Hafner the rescue swimmer, Dr. Pablo Clemente-Colón (pulling), and Dr. Dale Chayes steadying the sled.. © McKenzie Funk



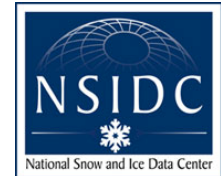
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# Domestic Partnerships

- **National Snow and Ice Data Center**
  - Archives NIC data
  - Co-generates the Multi-sensor Analyzed Sea Ice Extent (MASIE) with NIC
- **NASA – Goddard & Jet Propulsion Lab**
  - Algorithm testing and development
  - NIC identified as early adopter for NASA SMAP mission
- **Office of Naval Research**
  - Programs to enhance understanding of ice
  - Provide analyzed imagery to support research efforts
- **Naval Research Labs**
  - Evaluate the utility of new USN models
  - Partner on projects for model development
- **Bureau of Ocean Energy Management**
  - Partner on projects for improved sea-ice forecasting
- **Rutgers University Global Snow Lab**
  - Climate Data Record (CDR) using NIC Blended Snow
- **University of Washington – APL**
  - Coordination for IABP (funding and deployment)



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# International Partnerships

- **North American Ice Service (NAIS)**
  - Multi-agency partnership between U.S. National Ice Center (NIC), Canadian Ice Service (CIS), and U.S.C.G. International Ice Patrol (IIP)
- **International Arctic Buoy Program (IABP)**
  - Global participants working together to maintain a network of drifting buoys in the Arctic Ocean
- **International Ice Charting Working Group (IICWG)**
  - Promotes cooperation between the world's ice centers on all matters concerning sea ice and icebergs
- **WMO Expert Team on Sea Ice (ETSI)**
  - Formal coordination of sea ice activities on the level of WMO/IOC that provides technical direction to the WMO Secretariat
- **WMO Global Cryosphere Watch – SnowWatch**
  - Promotes cooperation between the world's snow observing nations



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# North American Ice Service



## SHARED RESOURCES

Imagery Savings est  $\geq$  \$1.6m/yr

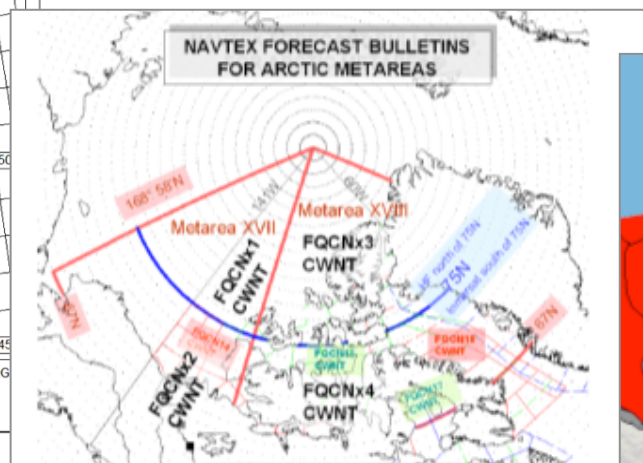
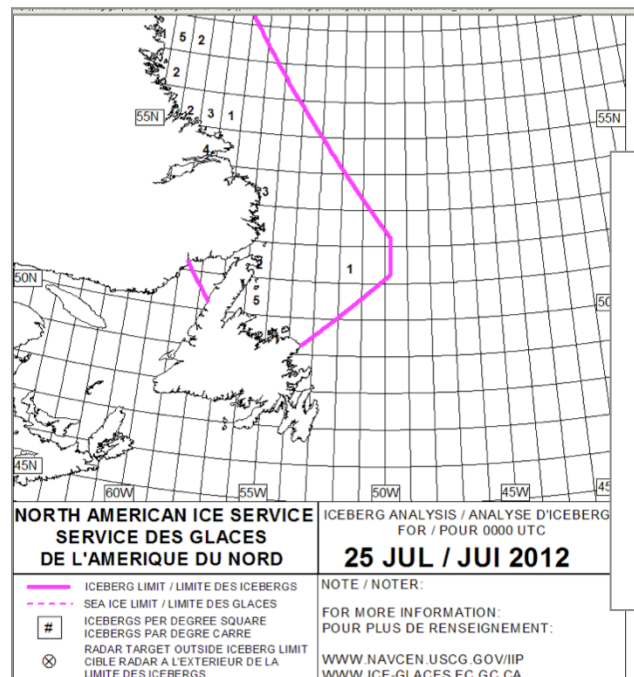
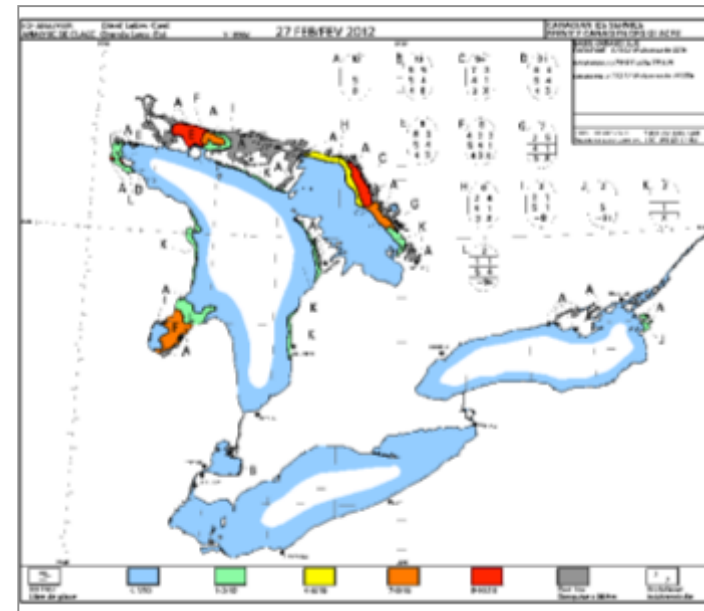
Man Hour Savings (NIC) est  $\geq$  \$ 50k/yr

Local Expertise

Flexibility to pursue new products

Support Joint Missions

Contingency for Critical Products



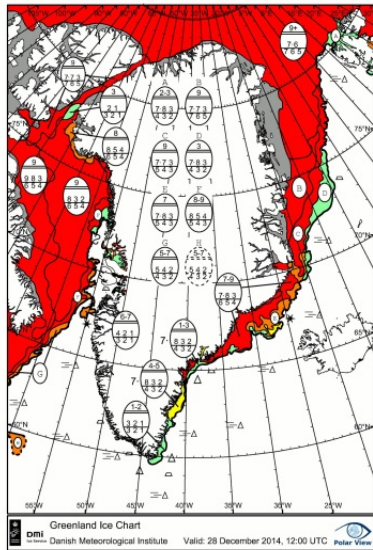
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# International Ice Charting Working Group



## SHARED RESOURCES

Sea Ice Analysis GIS Files

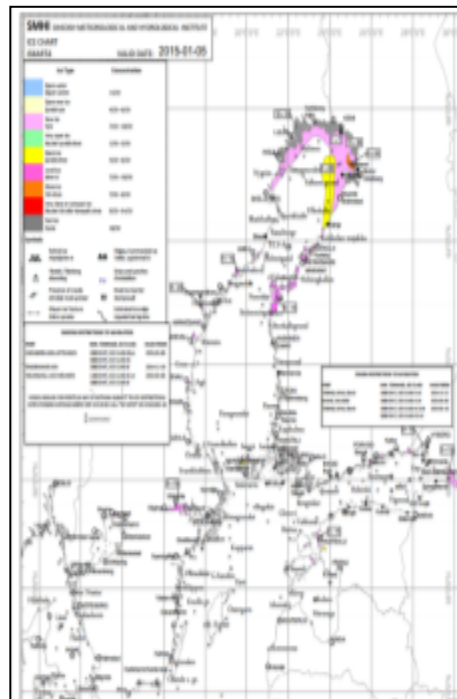
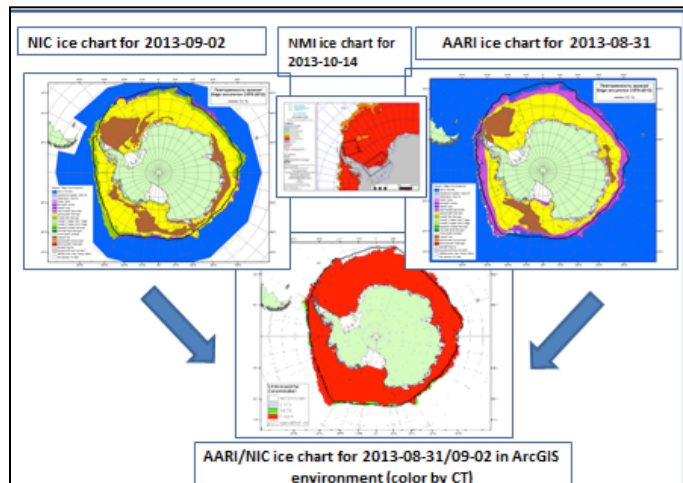
Man Hours

Local Expertise

Ice Reports

Imagery Savings

NIC, AARI and NMI are collaborating in Antarctic Analysis Harmonization

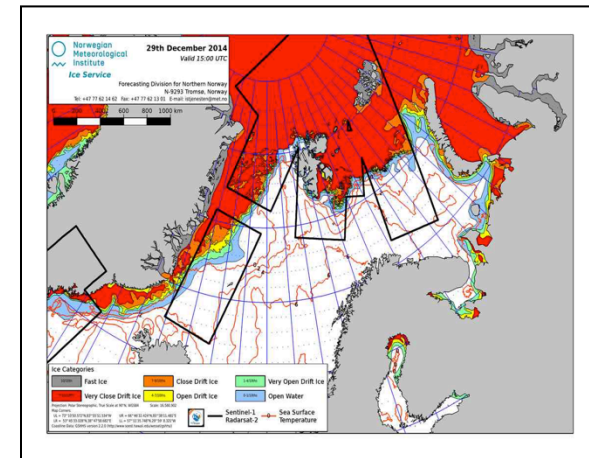


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Chile was the first Southern Hemisphere country to host the IICWG annual meeting in 2014,



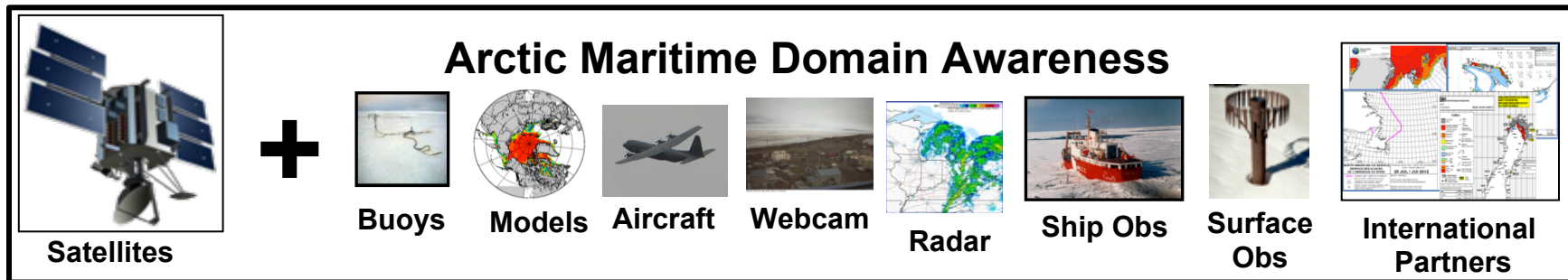
In October 2014, Brazil was the first of the South American countries to send personnel for ice Analyst training at NIC.



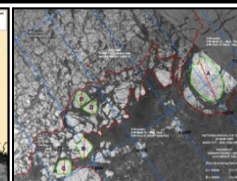
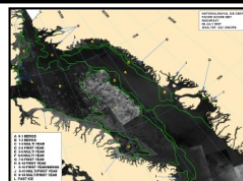


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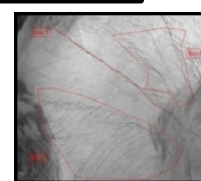
# Product Generation



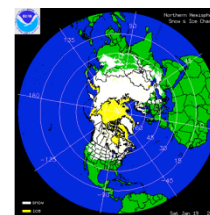
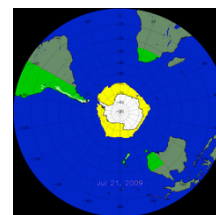
Annotated Images



Fractures, Leads and Polynyas (FLAP)

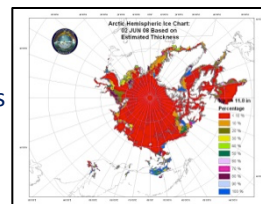


Automated Snow and Ice products



Blended Snow and ice cover

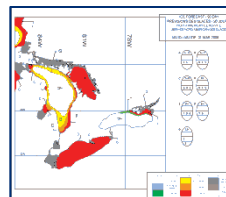
Ice Thickness Estimations



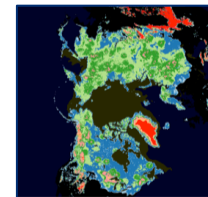
Antarctic Icebergs



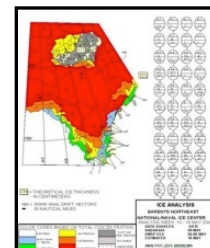
Ice Outlooks



Blended Snow Depth



Hemispheric and Regional Ice Charts



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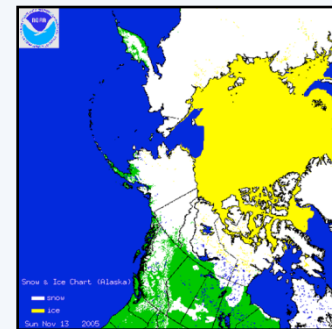
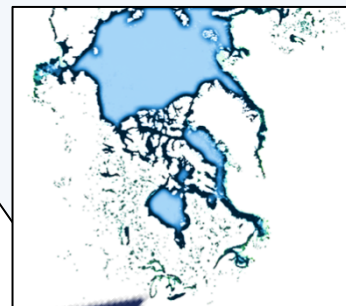
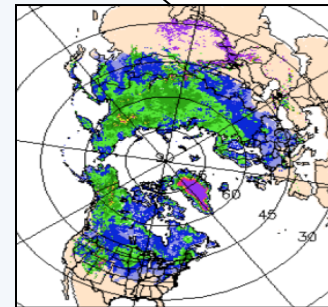
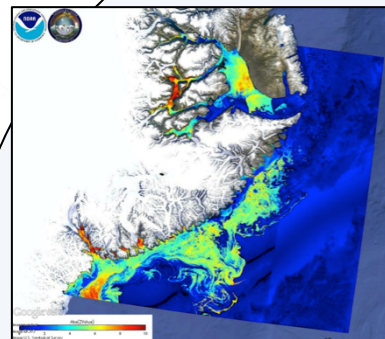
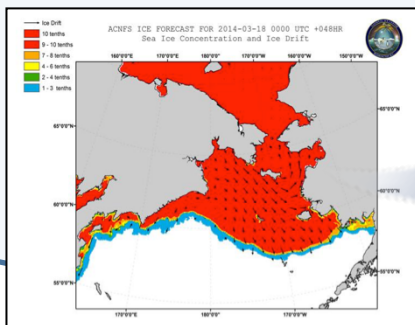
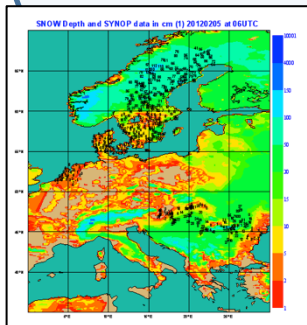
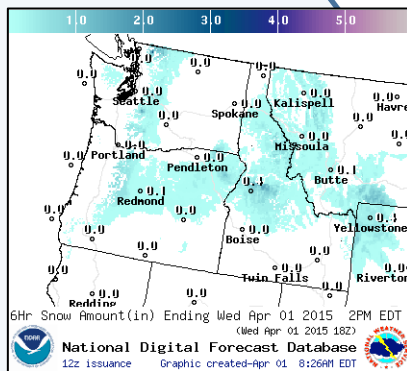
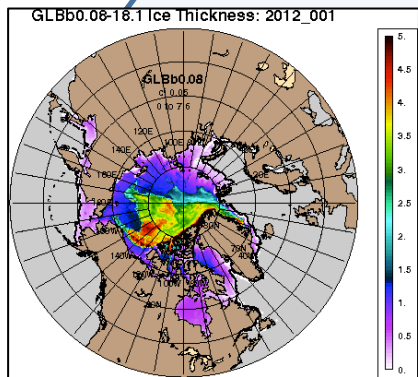
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# Integration with Models

CUSTOMERS & PUBLIC

NIC Analysis

Navy and NOAA Models



Models provide forecast guidance and NIC analysts incorporate real time data to produce interpretive analysis.

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# Arctic Cap Nowcast Forecast System

Surface Winds

Mean Sea Level Pressure

Surface Air Temperature

Sea Surface Temperature

Sea Ice Fraction

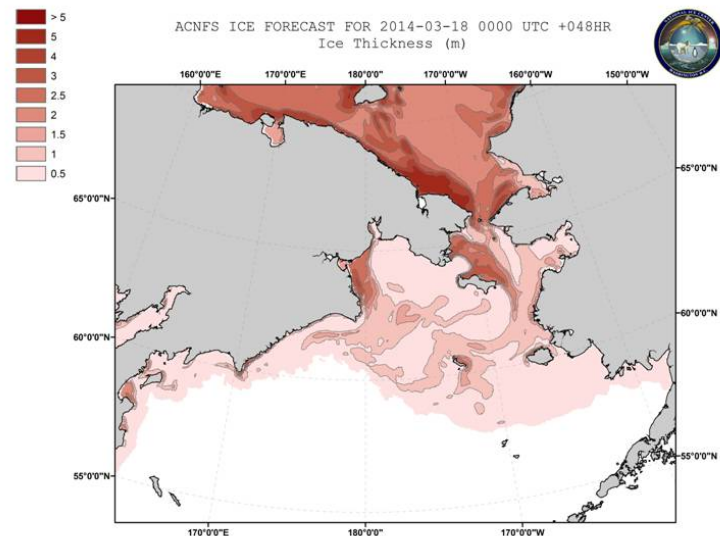
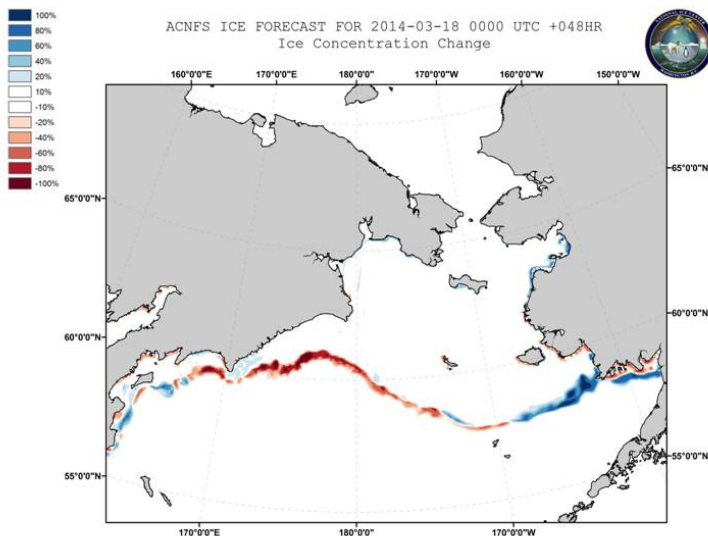
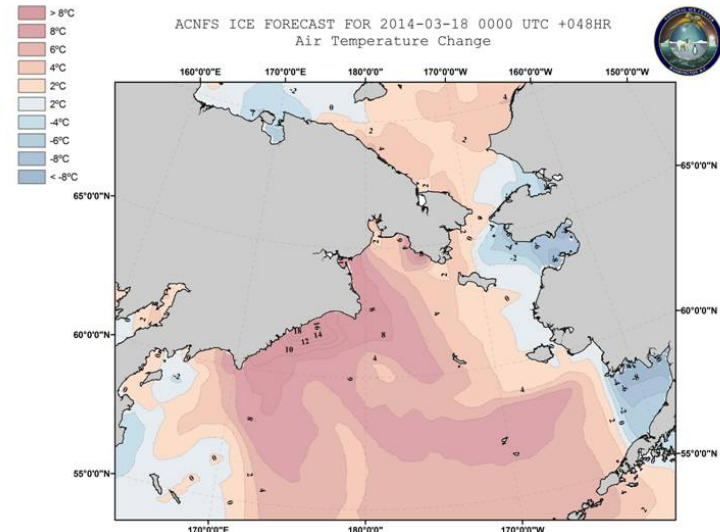
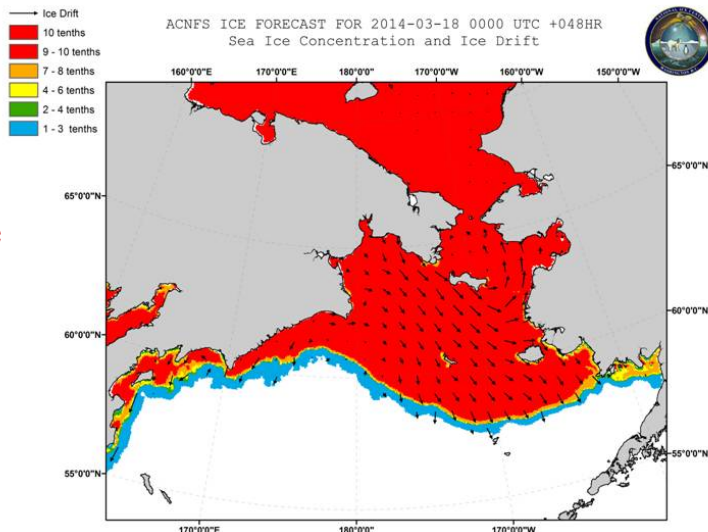
Sea Ice Thickness

Ice Drift

Lead Area Opening Rate

Sea Surface Salinity

Compressive Strength  
of Sea Ice

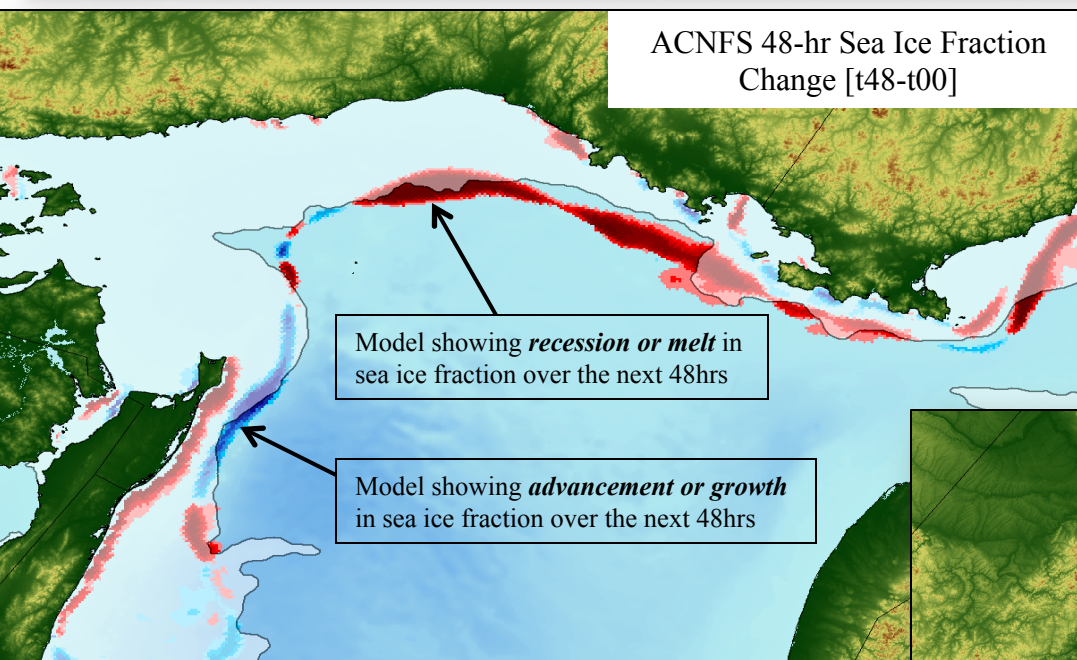


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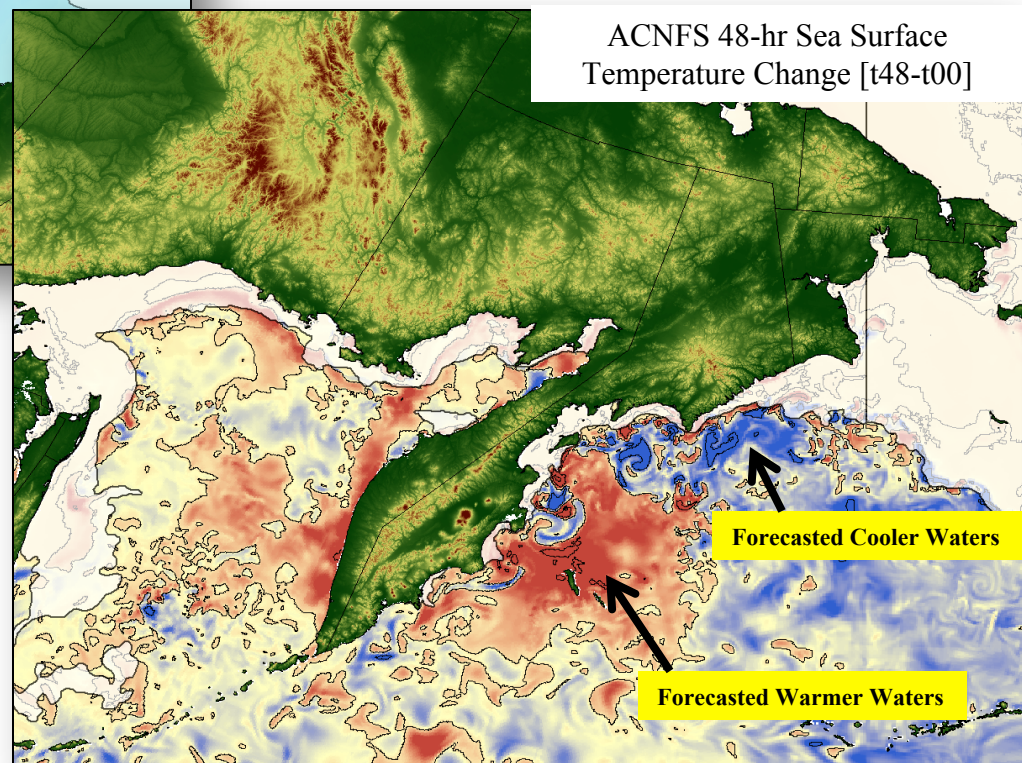
# ACNFS derived product use at NIC



## Change detection from ACNFS

- Produce 1-7 day difference fields
- Difference layers more precise and uniform

- Can be difficult to mentally interpolate small differences
- Less prone to interpretation errors

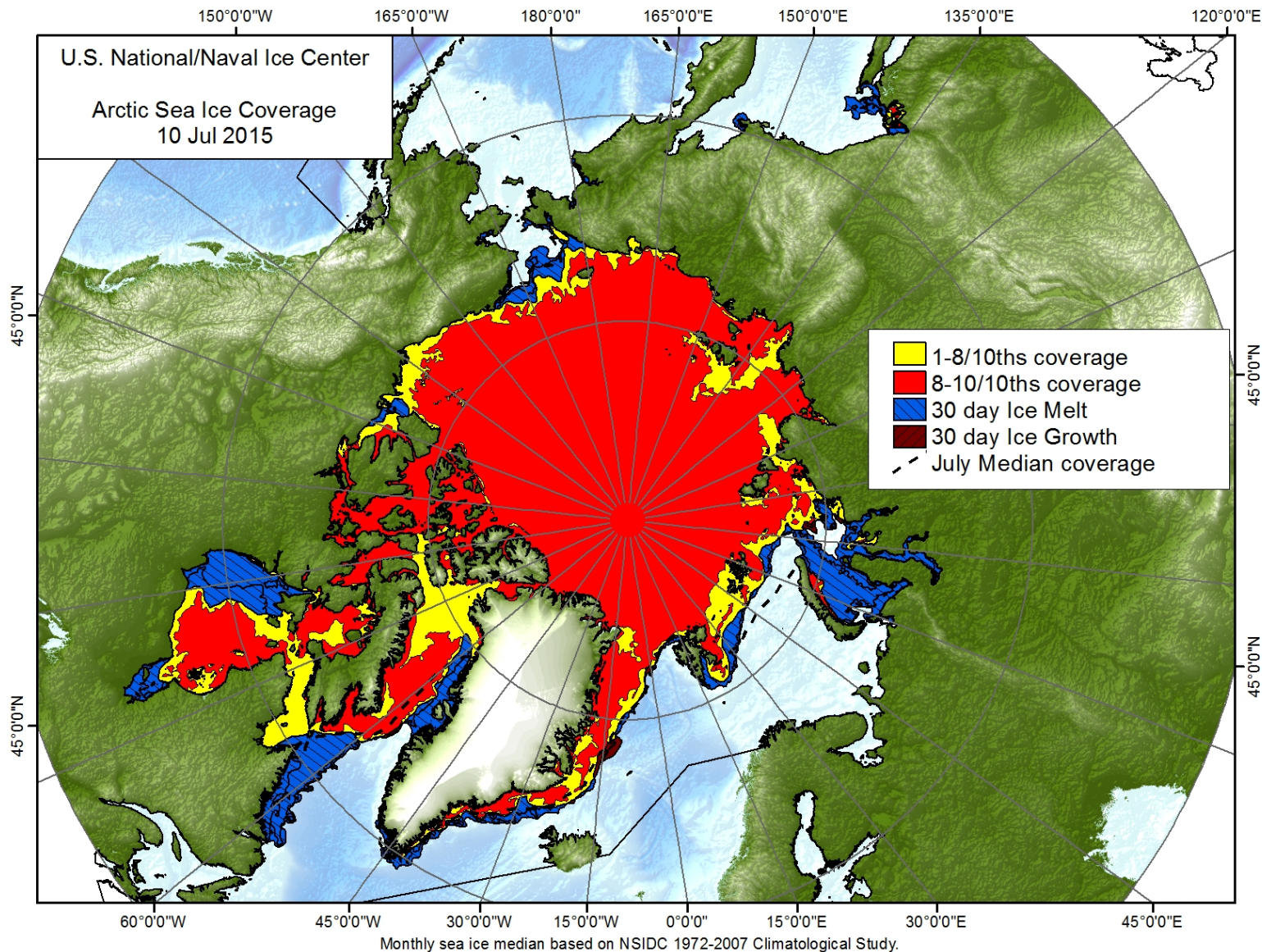


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# Arctic 30-day Change

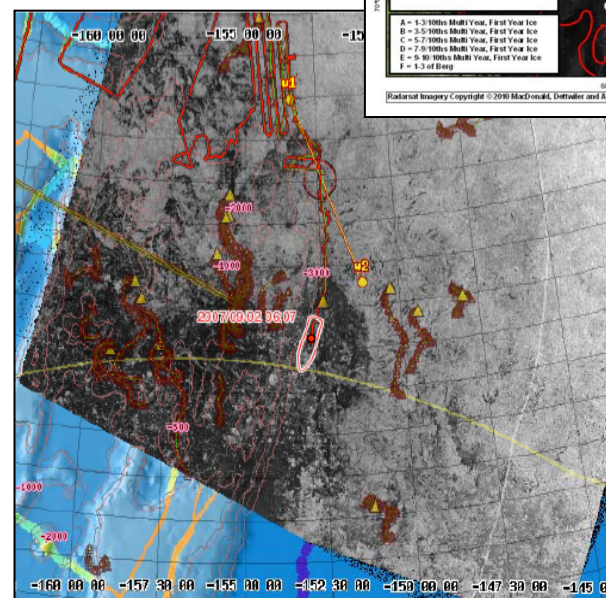
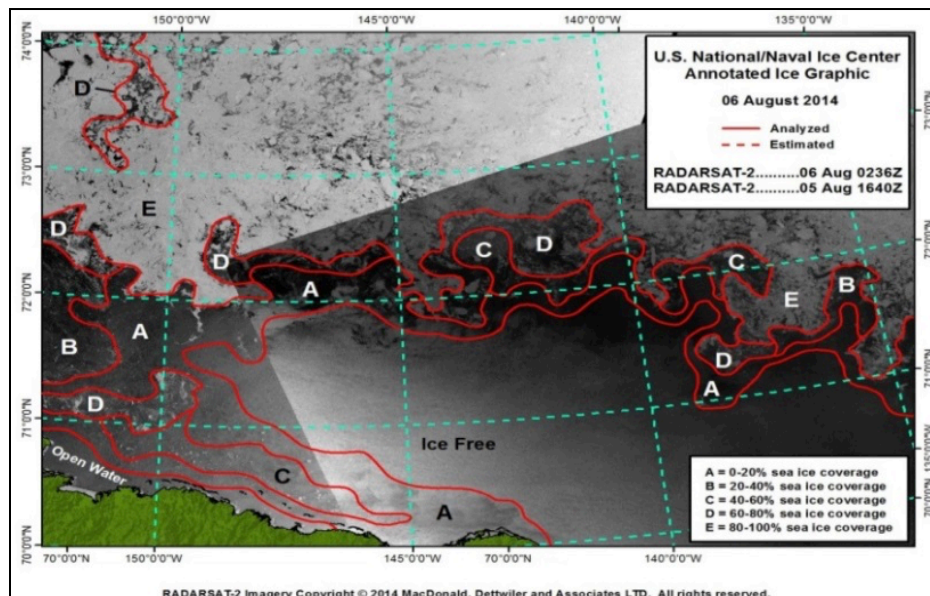
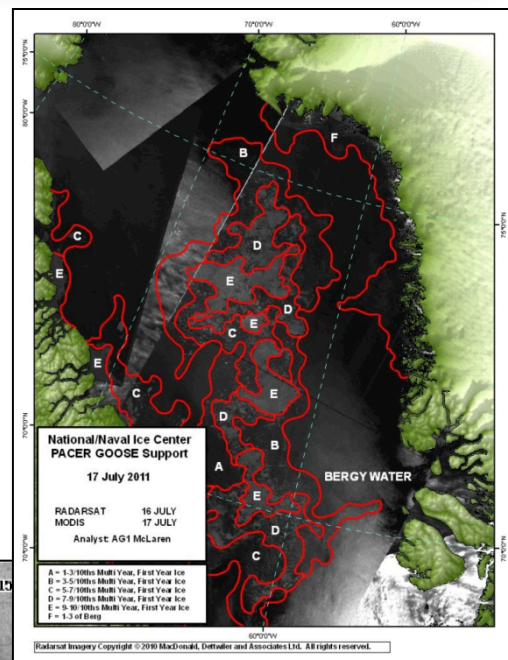
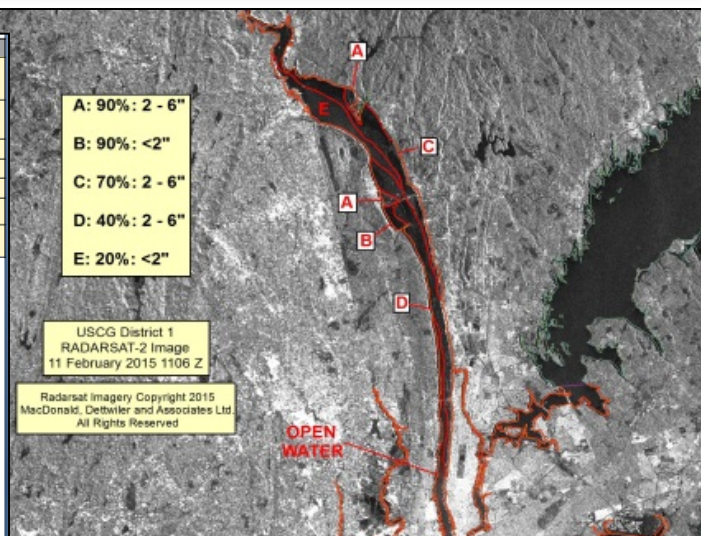
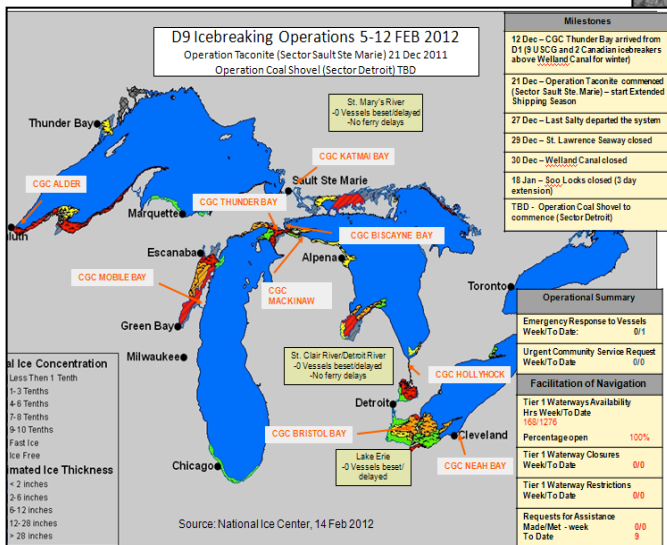






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# USNIC Tactical Support



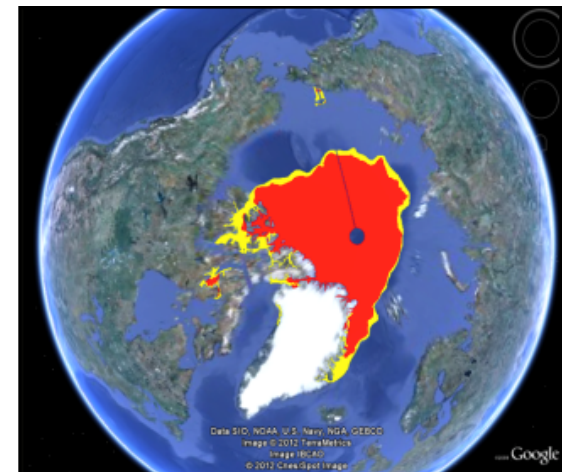
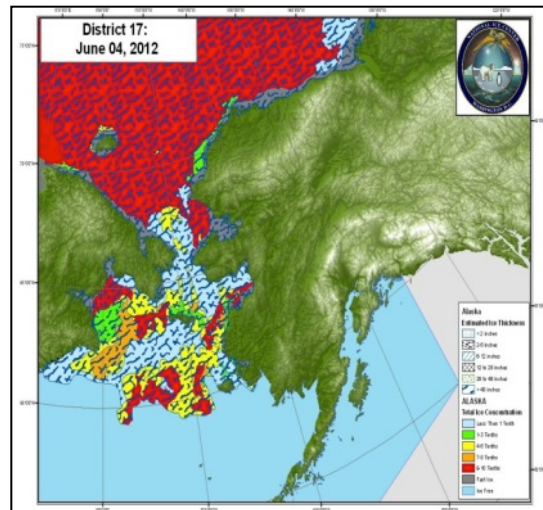
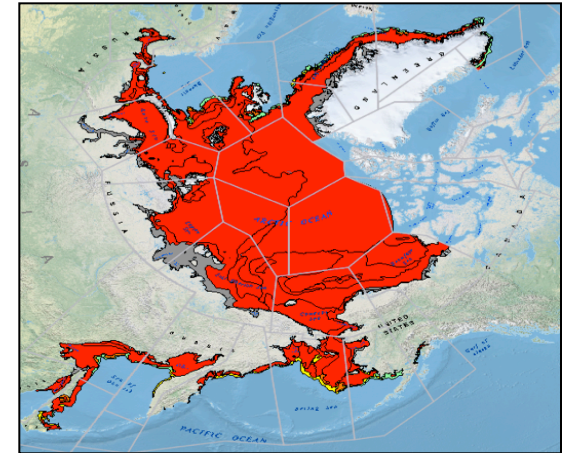
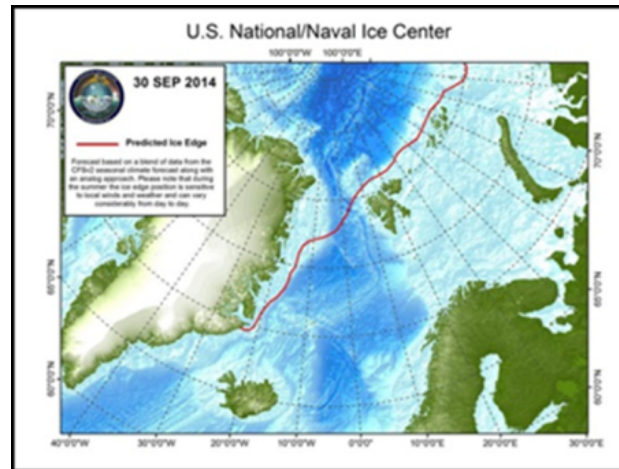
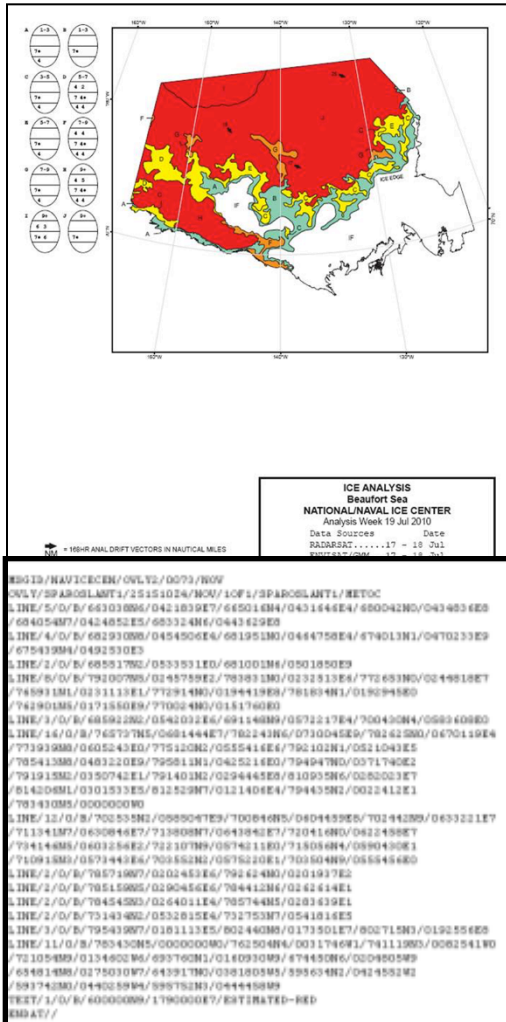
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# USNIC Routine Support



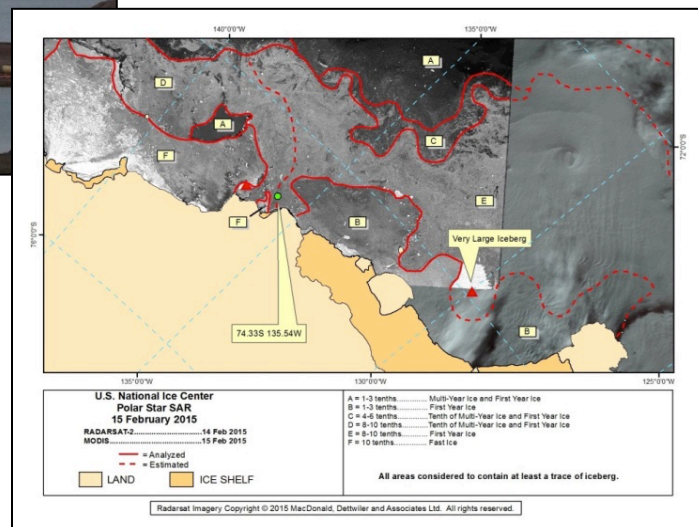
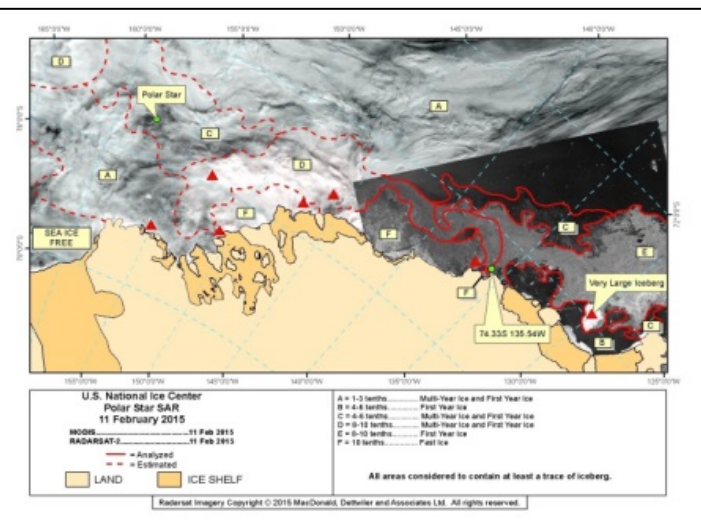
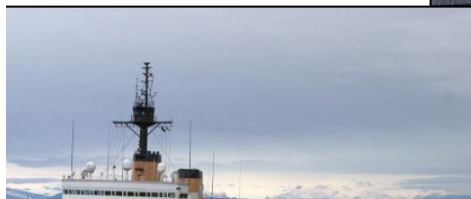
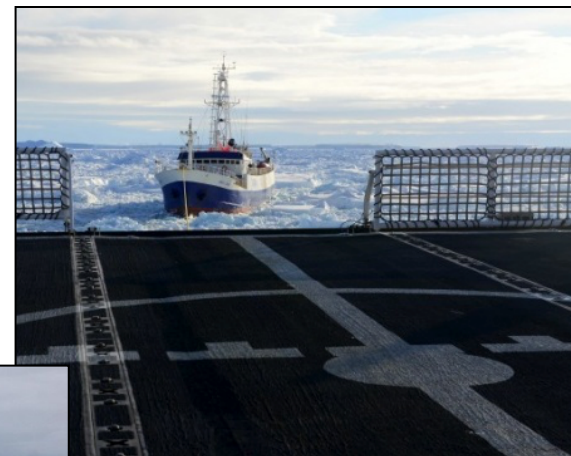
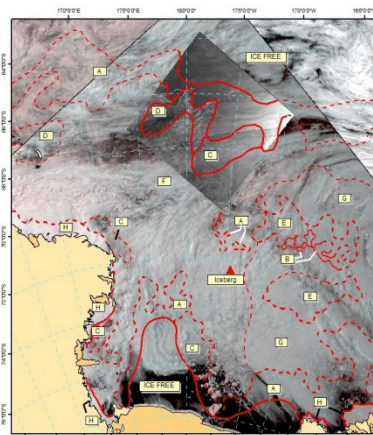
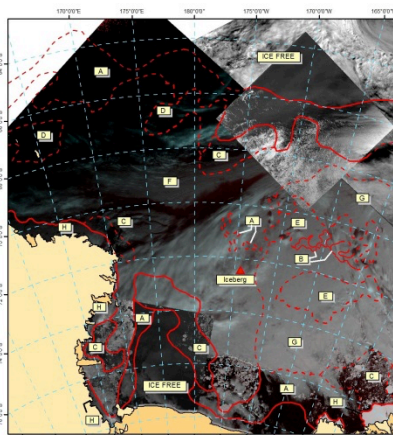
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# Mission Support – USCGC Polar Star

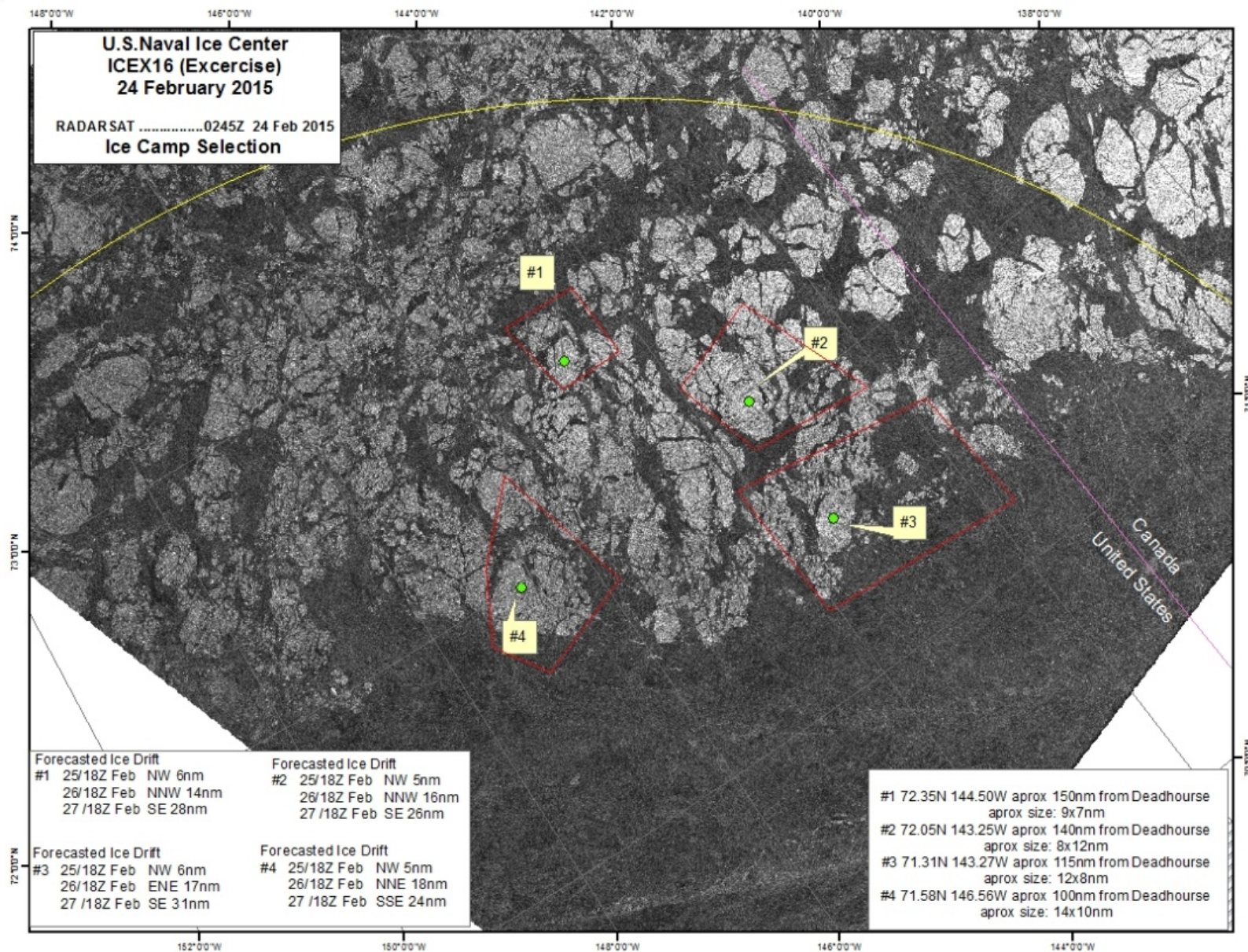


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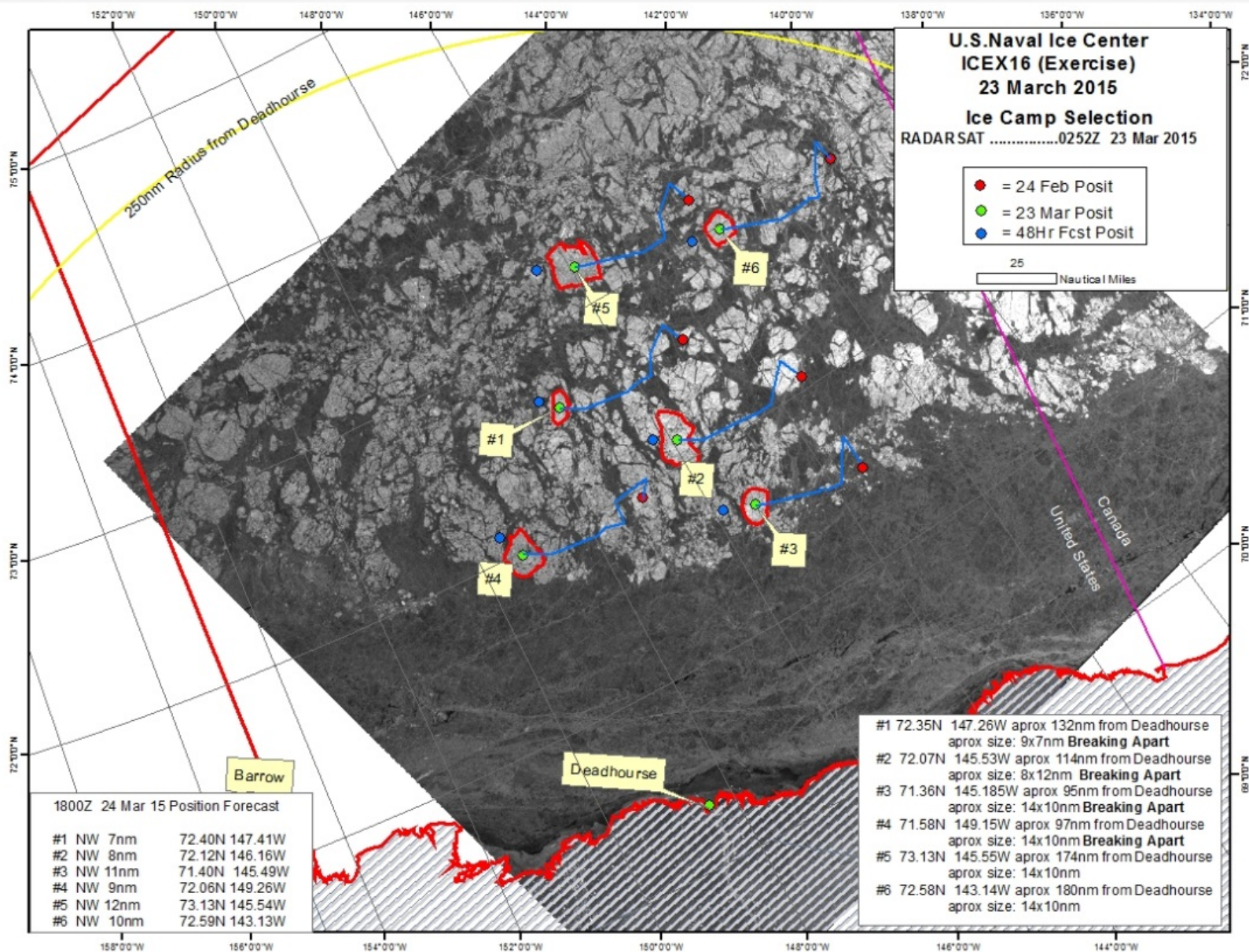
# Mission Support - ICEX 2016 Preparation







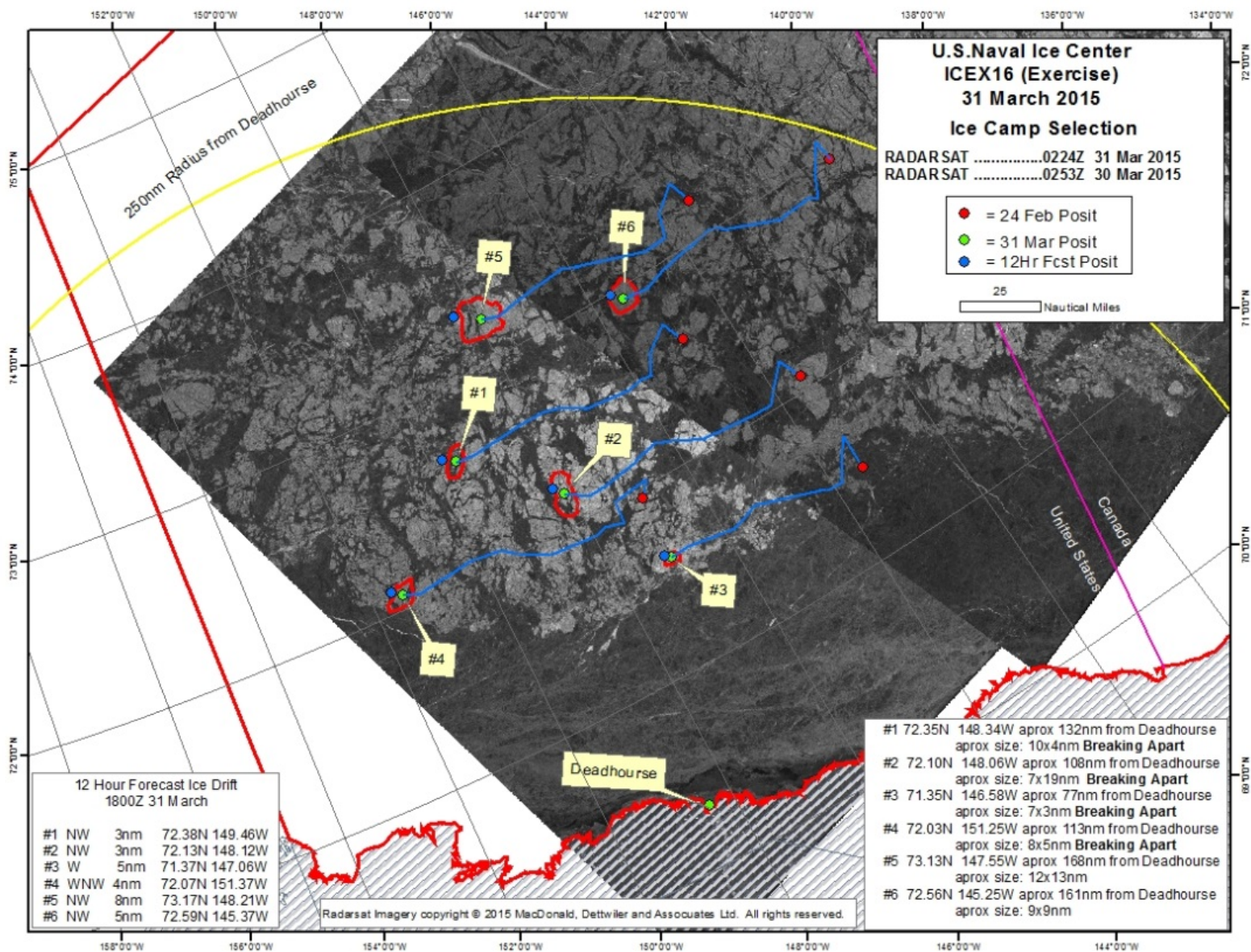
# Mission Support - ICEX 2016 Preparation







# Mission Support - ICEX 2016 Preparation







# Questions

